

Education and dementia

Research evidence supports the concept "use it or lose it"

See p 970

As long ago as the 2nd century BC poets and philosophers considered that an active mental life might forestall or delay the enfeeblement of old age.¹ In "De Senectute" Cicero suggested that old men preserved their intellects if they preserved their interests—"the use it or lose it" hypothesis.² In this week's journal a population based study reports that in elderly people a low level of education was associated with a higher prevalence of dementia, particularly Alzheimer's disease (p 970).³ In addition, several recent studies have indicated that education may protect against dementia.⁴⁻⁷ Bonaiuto *et al* found that the prevalence of Alzheimer's disease was 7.2% among illiterate people, 2.8% among those whose education had ceased at the fifth grade, and 0.5% among those who had studied in the fifth grade or over.⁵

Jorm suggested that people with high socioeconomic status might have a greater resistance to the effects of the dementing process, either because their better premorbid intellect reflected a higher level of neural reserve or because they tended to seek more stimulating environments, which helped to prevent a decline in cognitive skills.⁸ Other studies, however, found no link between education and the diagnosis of dementia,⁹ and the link between low social status and dementia may be due to a higher rate of vascular and secondary dementia in people from poor environments.¹⁰

If education does reduce the risk of dementia two mechanisms might explain the link. Education might in some way protect against neurodegeneration; or the onset of dementia might be delayed because education had improved neuronal networking so that when neurons died others could carry out similar functional tasks, so minimising signs of functional and cognitive impairment. Both of these mechanisms have strong practical implications.

In neurobiological research much debate has centred on whether the brain is more likely to degenerate as a result of overuse or underuse. Swaab argued that activation of nerve cells within the physiological range seemed to lead to the maintenance of neurones during aging and Alzheimer's disease, possibly by preferentially stimulating the action of protective mechanisms such as DNA repair.¹¹ He pointed to several studies showing that the brains of elderly rats exposed to an enriched environment had increased cortical thickness and weight and increased dendritic branching and that these rats' general performance was better than that of control rats from a non-stimulating environment. Dendritic growth continues in humans well into old age.¹² Nerve growth factor governs neuronal development, may play a part in

Alzheimer's disease, and seems to be influenced by environmental change.¹³ Those links might partly explain the actions of education and continued mental activity in delaying the onset of Alzheimer's disease.^{14 15}

The evidence in support of the neuronal networking mechanism has been reviewed by Katzman, who noted that cognitive change in Alzheimer's disease is largely predicted by the density of neocortical synapses.¹⁶ He suggested that education could increase brain reserve by increasing the density of neocortical synapses, so delaying the onset of symptoms in Alzheimer's disease by up to five years. That delay would halve the prevalence of dementia in the better educated people. Katzman also argued that research on rats showed that both the brain weight in adults and the numbers of neuronal dendritic processes were associated with stimulation in early life.

If the onset of dementia is delayed by an increase in the brain reserve a person may die before developing symptoms.^{16 17} By contrast, head injuries (due to boxing, for example) may deplete the brain reserve and bring forward the onset of a dementia syndrome.¹⁸

Yesavage showed that stimulation programmes may be effective in reducing memory problems associated with normal aging.¹⁹ Psychological research has shown that elderly people have cognitive reserve capacity, which can be activated by simple training programmes.²⁰ Even without explicit training old people can increase their cognitive performance.²⁰ In other words, not only previous education but also continued mental activity may be important for elderly people. Adult education programmes and stimulating mental activity may help improve coping skills and strategies for solving problems, and in turn these may help offset the cognitive effects of normal aging and delay the clinical symptoms associated with Alzheimer's disease. Two recent studies in patients with dementia showed that mental stimulation programmes had beneficial effects on cognitive performance as assessed by standard tests.^{21 22} The follow up was short, but even temporary improvements in cognition may benefit both patients and their families.

The combination of good education and continuing mental activity may mean that people have to undergo more cognitive deterioration before dementia becomes clinically obvious or before their scores in psychological testing are in the range indicating impairment. If education has neuroprotective effects it may delay the onset of the pathological process. Even if the effects of education are not neuroprotective but merely

induce better neuronal networking they will still delay the onset of the clinical syndrome while the underlying pathological process continues. The neuroprotective and neuronal networking mechanisms are not mutually exclusive and may interact. In practical terms, people with a high level of education who also have early dementia may have no well defined symptoms or signs, though their intellectual functioning could be adversely affected. This might be important if the sufferer had an intellectually demanding job or one that required a lot of new learning.

Delaying the onset of dementia will reduce its prevalence: fewer elderly people will develop a clinical picture of dementia during their lifetime. Alzheimer's disease and aging may be a continuum, with the prevalence of the disease continuing to rise in very old age.²³ The beneficial effects of education and mental stimulation may differ in different age groups. Further research is needed, but at present it seems prudent to recommend to elderly people that stimulating mental activity is worth while: there may be some truth in the saying "use it or lose it."

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- 1 Rosen G. Cross cultural and historical approaches. In: Hoch PH, Zubin J, eds. *Psychopathology of ageing*. New York: Grune and Stratton, 1961:1-20.
- 2 Pitt B. Social factors and old age. In: Bhugra D, Leff JP, eds. *Social psychiatry*. Oxford: Blackwell Scientific Publications, 1993:315-30.
- 3 Ott A, Breteler MMB, van Harskamp F, Claus JJ, van der Cammen TJM, Grobbee DE, et al. Prevalence of Alzheimer's disease and vascular. *BMJ* 1995;310:970-2.
- 4 Chandra V, Philpote V, Bell PA, Lazaro A, Schoenberg BS. Case-control study of late onset "probable Alzheimer's disease." *Neurology* 1987;37:1295-300.
- 5 Bonaiuto S, Rocca WA, Lippi A, Luciani P, Turtu F, Cavarzeran F, et al. Impact of education and occupation on the prevalence of Alzheimer's disease (AD) and multiinfarct dementia (MID) in Appignano, Macerata Province, Italy. *Neurology* 1990;40(suppl 1):346-7.
- 6 Zhang H, Katzman R, Salmon D, Jin H, Cai G, Wang Z, et al. The prevalence of dementia and Alzheimer's disease in Shanghai, China: impact of age, gender and education. *Ann Neurol* 1990;27:428-37.
- 7 Fratiglioni L, Grut M, Forsell Y, Viitanen M, Grafstrom M, Holmen K, et al. Prevalence of Alzheimer's disease and other dementias in an urban elderly population: relationship with age, sex and education. *Neurology* 1990;41:1886-92.
- 8 Jorm AF. *The epidemiology of Alzheimer's disease and related disorders*. London: Chapman and Hall Medical, 1990.
- 9 O'Connor DW, Pollitt PA, Treasure FP. The influence of education, social class and sex on the diagnosis of dementia in a community population. *Psychol Med* 1991;21:219-24.
- 10 Bickel H, Cooper B. Incidence and relative risk of dementia in an urban elderly population: findings of a prospective field study. *Psychol Med* 1994;24:179-92.
- 11 Swaab DF. Brain aging and Alzheimer's disease. "Wear and tear" versus "use it or lose it." *Neurobiol Aging* 1991;12:317-24.
- 12 Buell SJ, Coleman PD. Dendritic growth in the aged human brain and failure of growth in senile dementia. *Science* 1979;206:854-6.
- 13 Mohammed AK, Winblad B, Ebendal T, Larkfors L. Environmental influence on behaviour and nerve growth factor in the brain. *Brain Res* 1990;528:62-72.
- 14 Gall CM. Regulation of brain neurotrophin expression by physiological activity. *Trend Pharmacol Sci* 1992;103:401-3.
- 15 Perry EK, Perry RH. Neurochemical pathology and therapeutic strategies in degenerative dementia. *International Review of Psychiatry* 1993;5:363-80.
- 16 Katzman R. Education and the prevalence of dementia and Alzheimer's Disease. *Neurology* 1993;43:13-20.
- 17 Mortimer JA. Do psychosocial risk factors contribute to Alzheimer's disease. In: Henderson AS, Henderson JH, eds. *Etiology of dementia of Alzheimer's type*. Chichester: J Wiley, 1987:39-52.
- 18 Mortimer JA, Van Duijn CM, Chandra V, Fratiglioni L, Graves WA, Shalat SL, et al. Head trauma as a risk factor for Alzheimer's disease: a collaborative re-analysis of case control studies. *Int J Epidemiol* 1991;20(suppl 1):S28-35.
- 19 Yesavage JA. Non-pharmacological treatments for memory loss with normal ageing. *Am J Psychiatry* 1985;142:600-5.
- 20 Baltes P. The many faces of human ageing: toward a psychological culture of old age. *Psychol Med* 1991;21:837-54.
- 21 Breuil V, de Rotrou J, Forette F, Tortrat D, Ganasia-Ganem A, Frambourt A, et al. Cognitive stimulation of patients with dementia: preliminary results. *International Journal of Geriatric Psychiatry* 1994;9:211-7.
- 22 Koh K, Ray R, Lee J, Nair A, Ho T, Ang PC. Dementia in elderly patients: can the 3R stimulation programme improve mental status. *Age Ageing* 1994;23:195-9.
- 23 Brayne C, Calloway P. Normal ageing, impaired cognitive function and senile dementia of the Alzheimer's type: a continuum? *Lancet* 1988;ii:1265-7.

Hospital doctors' work

Managers should ensure that doctors know what is expected of them

The working practice of hospital doctors is not immune from the rapid changes occurring in the NHS. Already initiatives are eroding the traditional model of the consultant led medical firm. The combined effect of *Achieving a Balance*,¹ the new deal on junior doctors' hours,² and the Calman report³ has been to reduce the amount of support that consultants receive from junior doctors. The logical conclusion must be that we are moving away from a consultant led service towards a specialist based service. Such a change will have substantial implications for the working practices of hospital doctors and will need to be managed carefully and sensitively. Already some NHS trusts are bringing about some changes in this direction through their contracts with new consultants.

The Doctors' Tale, the recent report from the Audit Commission on the work of hospital doctors,^{4,5} provides more grist to the debate. In its role as an external auditor of the NHS the Audit Commission studied hospital medical staffing, looking mainly at the organisation and work practices of doctors in acute hospitals. The report acknowledges the substantial effect that doctors have on the service—for example, they account directly for a £2 billion of NHS expenditure, which is typically 14 per cent of an acute hospital's budget. It also points out that doctors should be well supported by managers, who must also share responsibility for patients' care and medical training. Doctors and managers clearly need to work well together.

One of the report's main criticisms is of the lack of clarity of role expected of a doctor. Junior doctors often perform tasks that could be performed by nurses or support workers such as phlebotomists. Under 60% of doctors in training grades have been given a job description setting out what they are expected to do. Junior staff also suffer from having to work rotas that depend more on providing a set number of tiers of cover than on the actual amount of work required. Unsupervised working is also highlighted. In some hospitals the senior house officer is the most senior doctor present in as many as one in five outpatient clinics. Consultants must ensure that junior medical staff have a structured training programme with appropriate supervision. Their work must be clearly defined in terms of both its scope and how much time should be devoted to it.

Consultants are criticised for doing private work, leaving their juniors to cope with the NHS work. The report produces figures to show that those doctors earning the most money from private practice do the least amount of NHS work. Only 54% of consultants were found to have attended all their fixed sessions. Moreover, the amount of work undertaken in each session varied among doctors. The message is clear: all consultants should have job plans, which should be monitored. One reason why consultants default on their sessional commitments—interestingly, not mentioned in the report—is that they have other NHS duties such as committee